

Kimberly Stachenfeld

DeepMind
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Education

JUNE 2018

Ph.D. Quantitative & Computational Neuroscience / Princeton University

Advised by Dr. Matthew Botvinick

JANUARY 2015

M.A. Quantitative & Computational Neuroscience / Princeton University

Dissertation: Efficient Codes for Representations underlying Reinforcement Learning Tasks

Advised by Drs. Matthew Botvinick, Kenneth Norman

MAY 2013

B.S. Chemical & Biological Engineering / Tufts University

B.S. Mathematics / Tufts University

Positions

2016 – PRESENT

Research Scientist / Neuroscience Team / DeepMind

2013 – PRESENT

Ph.D. Candidate / Quantitative & Computational Neuroscience / Princeton University

Advisor: Dr. Matthew Botvinick

SUMMER 2015

Research Intern / Navigation Team / DeepMind

Supervisors: Drs. Dharshan Kumaran, Raia Hadsell

SUMMER 2012

Research Assistant / Computational Neurobiology Lab / Yale School of Medicine

Supervisor: Dr. Mark Laubach

SUMMER 2011

Intern / Analytical Research & Development / Pfizer, Inc.

Supervisor: Dr. Stephen Brune

2010 – 2011

Research Assistant / Tissue & Metabolic Engineering Lab / Tufts University

Supervisor: Dr. Kyongbum Lee

Awards

- 2018 **Semi-finalist** MIT Technology Review 35 Innovators Under 35.
- 2014 **WiML (Women in Machine Learning) Travel Grant** to attend NIPS 2014 WiML Workshop.
- 2014 **Google Travel Grant** to attend NIPS 2014.
- 2014 **NSF Graduate Research Fellowship Program (GRFP) Honorable Mention**.
- 2012 **Tau Beta Pi** (Engineering Honor Society).
- 2012 **Meritorious Award** in COMAP International Mathematical Contest in Modeling (2/2).
- 2011 **Meritorious Award** in COMAP International Mathematical Contest in Modeling (1/2).
- 2010 **Karno Dean's Award** for Academic Excellence and Leadership. Tufts University.

Publications

Timothy E. J. Behrens, Timothy H. Muller, James C.R. Whittington, Shirley Mark, Alon B. Baram, [Kimberly L. Stachenfeld](#), Zeb Kurth-Nelson. (2018). **What is a cognitive map? Organising knowledge for flexible behavior**. BiorXiv. [preprint](#).

David Pfau, Stig Petersen, Ashish Agarwal, David Barrett, [Kimberly Stachenfeld](#). (2018). **Spectral Inference Networks: Unifying Spectral Methods With Deep Learning**. ArXiv. [preprint](#).

Jeremy Manning, Xia Zhu, Theodore L. Willke, Rajesh Ranganath, [Kimberly L. Stachenfeld](#), Uri Hasson, David M. Blei, Kenneth A. Norman. (2018). **A probabilistic approach to discovering dynamic full-brain functional connectivity patterns**. *NeuroImage*. [article](#), [preprint](#).

[Kimberly L. Stachenfeld](#), Matthew M. Botvinick, & Samuel J. Gershman. (2017). **The hippocampus as a predictive map**. *Nature Neuroscience* **20**: 1643–165. [article](#), [preprint](#).

[Kimberly L. Stachenfeld](#), Matthew M. Botvinick, & Samuel J. Gershman. (2014). **Design principles of the hippocampal cognitive map**. In *Advances in Neural Information Processing Systems (NIPS) 27*: 2528–2536. [article](#). **Selected for spotlight presentation**.

Marcelo S. Caetano, Lu E. Jin, Linda Harenberg, [Kimberly L. Stachenfeld](#), Amy F.T. Arnsten, & Mark Laubach. (2012). **Noradrenergic control of error perseveration in medial prefrontal cortex**. *Frontiers in Integrative Neuroscience* **6**: 125. [article](#).

Invited Talks

- October 2018 – **Alergic Seminar**, Sainsbury Wellcome Center, London, UK.
- September 2018 – **Invited Talk**, Sainsbury Wellcome Center, London, UK.
- August 2018 – **Invited Talk**, Janelia Research Campus, Ashburn, VA.
- May 2018 – **London Grid Cell Meeting**, Sainsbury Wellcome Center, London, UK.
- May 2018 – **Symposium on Hippocampal Network and Memory Across the Lifespan: Circuit, Code, Cognition**, Hungarian Academy of Sciences & Max Planck Institute for Human Development, Budapest, Hungary.
- February 2018 – **Behrens Lab Retreat**, Computational Neuroscience Lab @ Oxford University, UK.

- March 2018 – **Hippocampal computations and interactions supporting statistical learning and decision-making**, COSYNE Workshop, Breckenridge, CO.
- February 2018 – **London Judgment and Decision Making Seminar**, University College London, UK.
- May 2016 – **EADS Computer Science Talk**, University of Copenhagen, Copenhagen, DK.
- April 2016 – **Invited Talk**, Max Planck Centre, University College London, London, UK.
- January 2016 – **PNI In-House Seminar**, Princeton Neuroscience Institute, Princeton, NJ.
- June 2015 – **Reinforcement Learning Decision Making (RLDM)**, Edmonton, AB, Canada
- March 2015 – **Memory in action: The role(s) of the hippocampus in decisions for reward**, COSYNE Workshop, Snowbird, UT.
- December 2014 – **NIPS Spotlight presentation**, Neural Information Processing Systems (NIPS), Montreal, QC.

Posters

October 2016 – Kimberly L. Stachenfeld, Matthew M. Botvinick, Samuel J. Gershman. **The hippocampus as a predictive map**. Collaborative Research in Computational Neuroscience (CRCNS) Conference 2016, Paris, France.

October 2016 – Kimberly L. Stachenfeld, Jeremy R. Manning, Xia Zhu, Jeremy M. Cohen, Rajesh Ranganath, Erez Simony, Janice Chen, Uri Hasson, Ted Willke, David M. Blei, and Kenneth A. Norman. **A probabilistic approach for exploring functional brain networks in fMRI during story-telling and at rest**. 45th Meeting of the Society for Neuroscience (SfN), Chicago, IL.

June 2015 – Kimberly L. Stachenfeld, Matthew M. Botvinick, Samuel J. Gershman. **Reinforcement learning objectives constrain the cognitive map**. Reinforcement Learning Decision Making (RLDM) 2015, Edmonton, AB, Canada.

December 2014 – Kimberly L. Stachenfeld, Matthew M. Botvinick, Samuel J. Gershman. **Design Principles of the Hippocampal Cognitive Map**. Neural Information Processing Systems (NIPS) 27, Montreal, QC, Canada.

November 2014 – Kimberly L. Stachenfeld, Matthew M. Botvinick, Samuel J. Gershman. **Representations in Place Fields Facilitate Navigation and Reinforcement Learning**. 44th Meeting of the Society for Neuroscience (SfN), Washington, D. C.

November 2014 – Jeremy R. Manning, Kimberly L. Stachenfeld, Rajesh Ranganath, Kenneth A. Norman, David M. Blei. **Efficient Discovery of Functional Brain Networks in Large Multi-Subject fMRI Datasets**. 44th Meeting of the Society for Neuroscience (SfN), Washington, DC.

April 2013 – Kimberly L. Stachenfeld. **Hilbert Transform for Time - Frequency Domain Analysis of Local Field Potentials**. Cognitive & Brain Sciences Poster Session. Tufts University, Medford, MA.

October 2013 – Michael C. Yi, Gautham V. Sridharan, Katherine K. Carson, Kimberly L. Stachenfeld, Kyongbum Lee. **Targeted Metabolomics of Cofactors in Altered Liver Metabolism**. Annual American Institute of Chemical Engineering Meeting, Minneapolis, MN.

Ad hoc Reviewer

- eLife
- Nature Scientific Reports
- IEEE Transactions on Neural Networks and Learning Systems
- Proceedings on Neural Information Processing Systems (NIPS)

Press

- [The Surprising Relativism of the Brain's GPS](#). Nautilus (22 March 2018).
- [DeepMind's New Way to Think About the Brain Could Improve How AI Makes Plans](#). MIT Technology Review (3 October 2017).
- [The hippocampus of the brain holds the secret of the nature of learning, which is a new discovery by DeepMind](#). 36Kr (3 October 2017).
- [The hippocampus as a 'predictive map'](#). Hacker News post (201 points, 46 comments).
- [The hippocampus as a 'predictive map'](#). DeepMind blog (2 October 2017).

Workshops

MARCH 2018

Co-organizer / Model-Based Cognition: Hierarchical Reasoning and Sequential Planning / COSYNE Workshop / Breckenridge, CO

MAY 2015

Co-organizer / Princeton Neuroscience Retreat / Red Bank, NJ

Teaching

SPRING 2015

Teaching Assistant / NEU259: Introduction to Cognitive Neuroscience / Princeton University

Taught by: Dr. Yael Niv

[Course description](#).

FALL 2014

Teaching Assistant / NEU258: Fundamentals of Neuroscience / Princeton University

Taught by: Dr. Michael Graziano

[Course description](#).

FALL 2014

Instructor / Math 135 & 37, Prison Teaching Initiative / Princeton University

Taught mathematics in New Jersey correctional facilities. [Get involved!](#)

FALL 2012

Senior Mentor / Chemical & Biological Engineering / Tufts University

2010 – 2012

Tutor / Physics, Chemistry, & Calculus, Academic Resource Center / Tufts University

Other fun things

- **3rd degree blackbelt, Isshinryu Karate.** Trained 1998 – 2013 at [Isshinryu Karate of Madison and Bernardsville](#) (since age 7). Multiple medals in sparring and forms in local competitions.
- **1st degree blackbelt, Tae Kwon Do.** Trained 2009 – 2013 with the [Tufts Tae Kwon Do Team](#) and 2013 – 2015 with the [Princeton Tae Kwon Do Team](#). Multiple medals in sparring and forms in inter-collegiate [ECTC](#) tournaments.
- **Painting, drawing, sketching, & doodling.** I have loved to draw since I could hold a pencil, but I'm recently enamored of human life drawing. I think I like it now because depicting abstractions of human forms works with my research ambition to understand abstractions in the human brain. I practice at the [London Life Drawing Salon](#) in Bethnal Green.
- **Running.** Ran varsity track and cross country through high school. I completed my [first half-marathon](#) in high school. I have recently got back into running and completed the [10k London Winter Run](#) this February while training for a half-marathon in 2018.